



# Journal of Cardiology Cases

journal homepage: [www.elsevier.com/locate/jccase](http://www.elsevier.com/locate/jccase)



## Case Report

## Repair of left ventricular aneurysm with acellular dermis graft: A case report

Philip S. Lim (MD)<sup>a,\*</sup>, Nancy Bierowski (RN)<sup>b</sup>, Mauricio Garrido (MD)<sup>b</sup>, Robert Watson (MD)<sup>c</sup>, Asoka Balaratna (MD)<sup>c</sup>, V. Paul Addonizio (MD)<sup>b</sup>

<sup>a</sup> Department of Radiology, Abington Memorial Hospital, 1200 Old York Road, Abington, PA 19001, USA

<sup>b</sup> Department of Cardiothoracic Surgery, 1200 Old York Road, Abington Memorial Hospital, Abington, PA 19001, USA

<sup>c</sup> Department of Cardiology, 1200 Old York Road, Abington Memorial Hospital, Abington, PA 19001, USA

### ARTICLE INFO

#### Article history:

Received 29 November 2011

Accepted 19 April 2012

#### Keywords:

Acellular dermis graft

Left ventricular aneurysm

Heart failure

### SUMMARY

We report the use of a novel graft material in cardiac surgery, acellular human dermis graft, to repair a left ventricular aneurysm in a patient undergoing surgical ventricular restoration. We also describe the postoperative magnetic resonance imaging characteristics of the dermis graft. We conclude that acellular dermis graft has material handling properties that allow it to be used in left ventricular aneurysm repair. On magnetic resonance imaging, there is no gadolinium enhancement of the graft and the graft is akinetic.

© 2012 Japanese College of Cardiology. Published by Elsevier Ltd. All rights reserved.

## Introduction

Patients suffering from congestive heart failure secondary to ischemic cardiomyopathy and ventricular aneurysm may benefit from surgical ventricular restoration and aneurysmectomy [1–4]. We chose to use acellular dermis instead of traditional synthetic grafts to repair the left ventricular aneurysm for several reasons. First, acellular dermis matrix, which is donated human skin that has undergone a multistep proprietary process to remove the epidermis and cells which could cause tissue rejection, has been extensively used for general surgery reconstruction procedures [5]. It also provides a matrix for the patient's own blood vessels and cells to grow into the graft material, unlike other reconstruction materials [6–8]. In addition, the biological etiology of this material may be theoretically more resistant to infection than synthetic materials also used to repair ventricular aneurysms. To our knowledge, this is the first reported use of acellular dermis graft in cardiac surgical repair.

## Case report

The patient is a 39-year-old male who had prior history of myocardial infarction 2 years previously and was treated with coronary artery stenting of the left anterior descending coronary artery. He most recently presented with recurrent angina. At catheterization, there was severe in-stent restenosis and an ejection fraction of 40%. Thrombus was present in the 4.3 cm diameter apical aneurysm



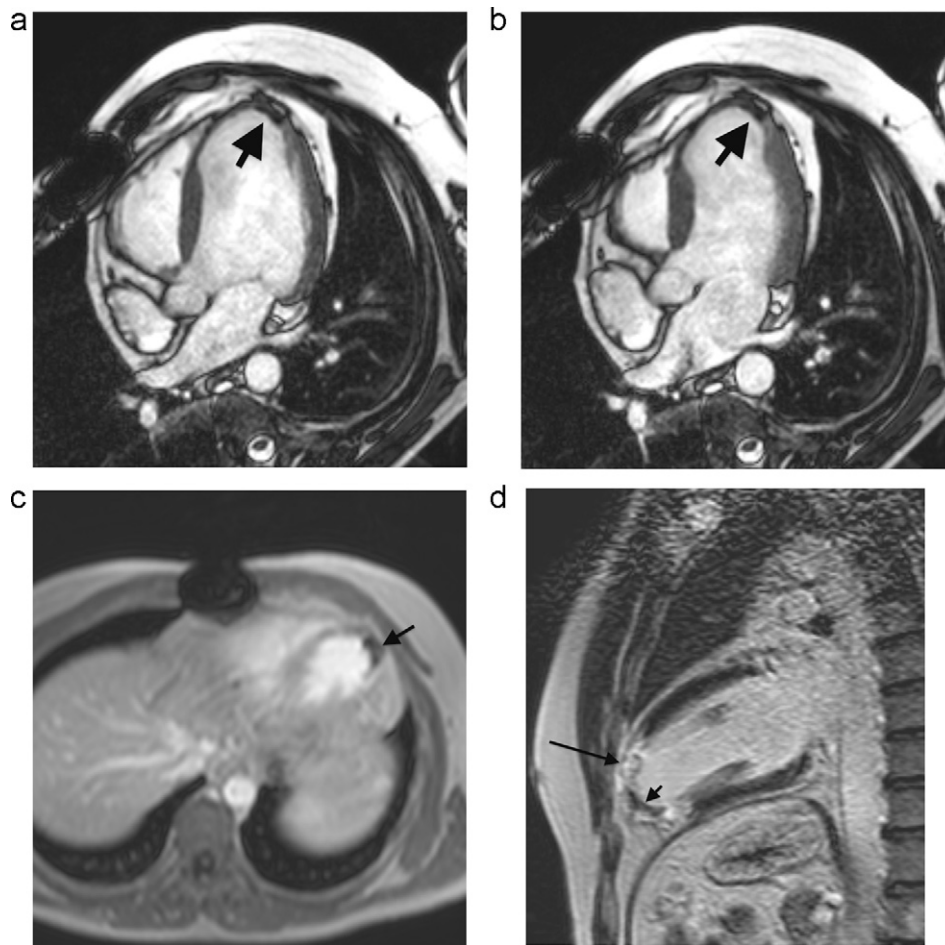
Figure 1. Acellular dermis graft material.

at echocardiography. Viability studies demonstrated the distal anteroapical and inferoapical segments to be fixed consistent with scar.

Left ventricular aneurysmectomy and reconstruction of the wall with acellular dermis were performed followed by coronary artery bypass graft. The surgical technique of left ventricular aneurysmectomy and graft placement was as follows (Fig. 1): after initiation of cardiopulmonary bypass, the ventricular aneurysm was resected along a junction identified between normal contractile ventricle and the aneurysmal wall in the decompressed left ventricle. Endocardial resection and cryoablation of the defect border was performed. A 3-0 Prolene pursestring was then utilized

\* Corresponding author. Tel.: +1 215 481 6331; fax: +1 215 481 2208.

E-mail address: [plim@amh.org](mailto:plim@amh.org) (P.S. Lim).



**Figure 2.** Magnetic resonance imaging study at 3 months after surgery. (a) Steady state free precession pulse sequence in pseudo 4 chamber view shows akinetic graft in diastole (arrow). (b) Steady state free precession pulse sequence in pseudo 4 chamber view shows akinetic graft in systole (arrow). (c) Immediate post gadolinium contrast T1 weighted image of the left ventricle in the axial plane shows the low signal graft (arrow). (d) Delayed post gadolinium contrast T1 weighted image of the left ventricle in the vertical long axis orientation shows the low signal graft (short arrow) along endocardial surface in area of hyperintense infarction (long arrow).

to reduce the defect to approximately 3 cm in diameter. Acellular dermis graft (AlloDerm, LifeCell Corporation, Branchburg, NJ, USA) of approximately 0.1 cm thickness was cut to the size of the remaining ventricular defect. The graft was then sewn to the endocardial border of this defect with 4-0 Prolene in a running stitch to reconstruct the luminal geometry of the left ventricle to as normal as possible. The ventricular myocardium was then approximated along the epicardial side of the acellular dermis graft. The graft borders were marked with metal clips to more accurately identify its location on magnetic resonance imaging (MRI). This patient was imaged preoperatively and at 3 and 9 months after surgery.

MRI was performed on a 1.5 Tesla Philips Intera (Release 12; Best, Netherlands) using a 5 channel cardiac coil and the following sequences: steady state free precession sequences, T1 and T2 weighted, resting perfusion, and 2- and 3-dimensional delayed inversion recovery post gadolinium sequences in standard cardiac chamber views. Multihance (gadobenate diglumine) gadolinium contrast dose of (0.1 mmol/kg body weight) was used.

Results at 3 and 9 months after surgery, the patient had a stable postoperative ejection fraction of 40% by MRI and New York Heart Association (NYHA) Class 1 functional classification. At 3 years after surgery, the patient remains at NYHA Class 1 functional status. The acellular dermis graft has low signal on T1 and T2 inversion recovery sequences and was akinetic during cine wall motion analysis (Fig. 2a and b). There was no gadolinium enhancement on early and delayed imaging of the graft material (Fig. 2c and d). An

accepted standard for the detection of ventricular thrombus is a low signal intraventricular mass on delayed contrast enhancement imaging [9]. From other experience with acellular graft dermis we note that the graft can be differentiated from ventricular thrombus by prior knowledge of the use of the graft material and by observing that, unlike thrombus, the smooth contour of the graft is contiguous with the endocardial surface of the adjacent myocardium.

## Discussion

We present our use and MRI evaluation of acellular dermis graft in left ventricular aneurysm repair. First, acellular dermis graft has material handling properties that allow it to be used in left ventricular surgery. Second, although prior general surgical studies have shown pathologic confirmation that new capillaries form within graft used in hernia repairs, the graft utilized to repair the left ventricular aneurysm was akinetic and did not enhance with contrast by MRI. We cannot demonstrate by MRI that cells have grown into the graft.

## Conflicts of interest

All authors have no conflicts of interest that should be disclosed.

## Acknowledgments

**Funding:** Innovators' Circle Grant (internal hospital grant), Abington Memorial Hospital, 1200 Old York Road, Abington, PA 19001, USA.

## Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <http://dx.doi.org/10.1016/j.jccase.2012.04.006>.

## References

- [1] Athanasuleas CL, Buckberg GD, Stanley AW, Siler W, Dor V, Di Donato M, Menicanti L, Almeida de Oliveira S, Beyersdorf F, Kron IL, Suma H, Kouchoukos NT, Moore W, McCarthy PM, Oz MC, et al. Surgical ventricular restoration in the treatment of congestive heart failure due to post-infarction ventricular dilation. *J Am Coll Cardiol* 2004;44:1439–45.
- [2] Stanley AW, Athanasuleas CL, Buckberg GD, RESTORE Group. Heart failure following anterior myocardial infarction: an indication for ventricular restoration, a surgical method to reverse post-infarction remodeling. *Heart Fail Rev* 2004;9:241–54.
- [3] Athanasuleas CL, Buckberg GD, Stanley AW, Siler W, Dor V, DiDonato M, Menicanti L, de Oliveira SA, Beyersdorf F, Kron IL, Suma H, Kouchoukos NT, Moore W, McCarthy PM, Oz MC, et al. Surgical ventricular restoration: the RESTORE group experience. *Heart Fail Rev* 2004;9:287–97.
- [4] Buckberg GD, Athanasuleas CL. Seeing congestive heart failure with the eyes of the mind: a surgical view. *Semin Thorac Cardiovasc Surg* 2001;13:431–4.
- [5] <http://www.lifecell.com/alloderm-regenerative-tissue-matrix/96/>. LifeCell Corporation [accessed November 21, 2011].
- [6] Buinewicz B, Rosen B. Acellular cadaveric dermis (AlloDerm): a new alternative for abdominal hernia repair. *Ann Plast Surg* 2004;52:188–94.
- [7] Kim H, Bruen K, Vargo D. Acellular dermal matrix in the management of high-risk abdominal wall defects. *Am J Surg* 2006;192:705–9.
- [8] Menon NG, Rodriguez ED, Byrnes CK, Girotto JA, Goldberg NH, Silverman RP. Revascularization of human acellular dermis in full-thickness abdominal wall reconstruction in the rabbit model. *Ann Plast Surg* 2003;50: 523–7.
- [9] Hendel RC, Patel MR, Kramer CM, Poon M, Hendel RC, Carr JC, Gerstad NA, Gillam LD, Hodgson JM, Kim RJ, Kramer CM, Lesser JR, Martin ET, Messer JV, Redberg RF, et al. ACCF/ACR/SCCT/SCMR/ASNC/NASCI/SCAI/SIR 2006 appropriateness criteria for cardiac computed tomography and cardiac magnetic resonance imaging: a report of the American College of Cardiology Foundation Quality Strategic Directions Committee Appropriateness Criteria Working Group, American College of Radiology, Society of Cardiovascular Computed Tomography, Society for Cardiovascular Magnetic Resonance, American Society of Nuclear Cardiology, North American Society for Cardiac Imaging, Society for Cardiovascular Angiography and Interventions, and Society of Interventional Radiology. *J Am Coll Cardiol* 2006;48:1475–97.